

Tissues

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أصل جنيني (مشارك) د

A tissue is a collection of cells with a common embryologic origin that work together to perform specialized activity. In addition to the cells, a tissue contains the extracellular matrix (ECM) which's found between the cells.

تحتل البيئة المحيطة بهذه الخلايا

- Body tissues can be generally divided into 4 main types according to the *type of cells* and the *amount and content of the ECM* they possess.

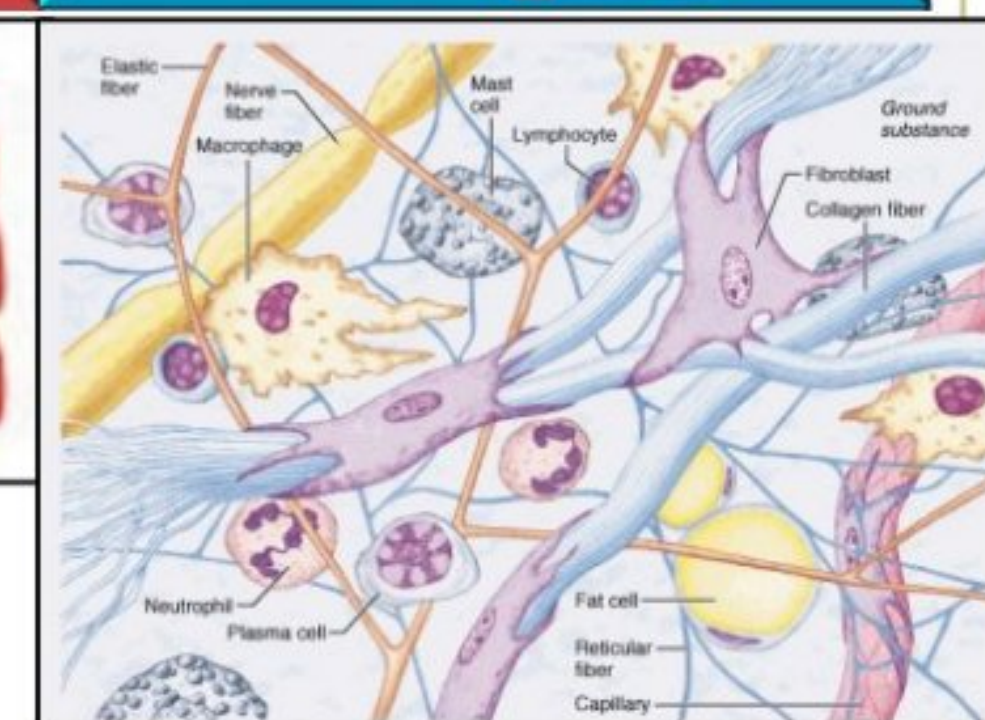
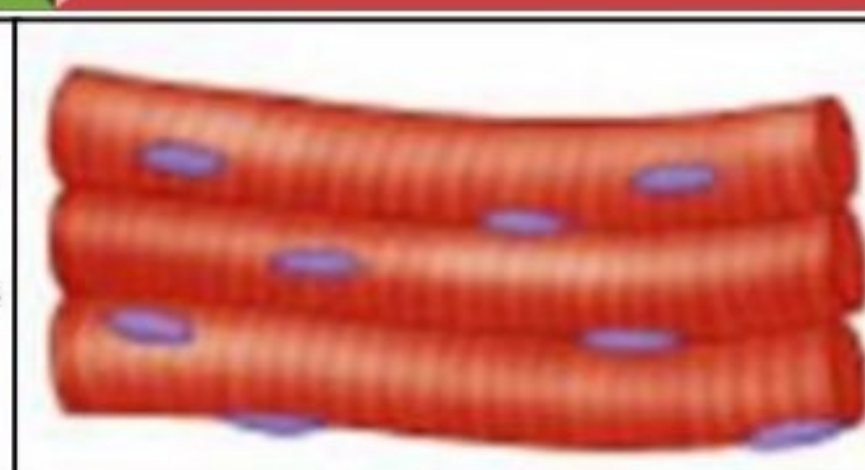
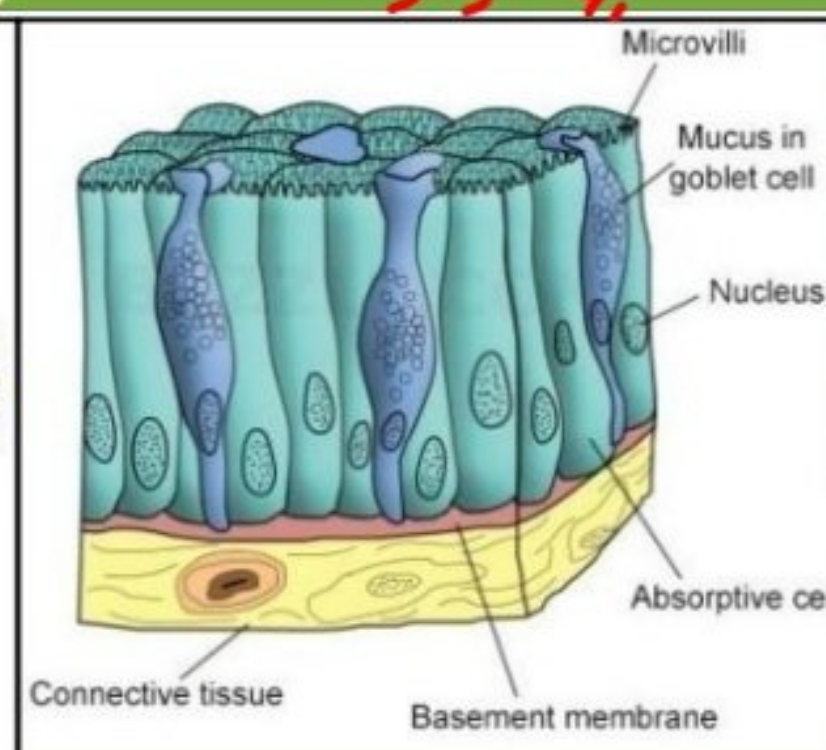
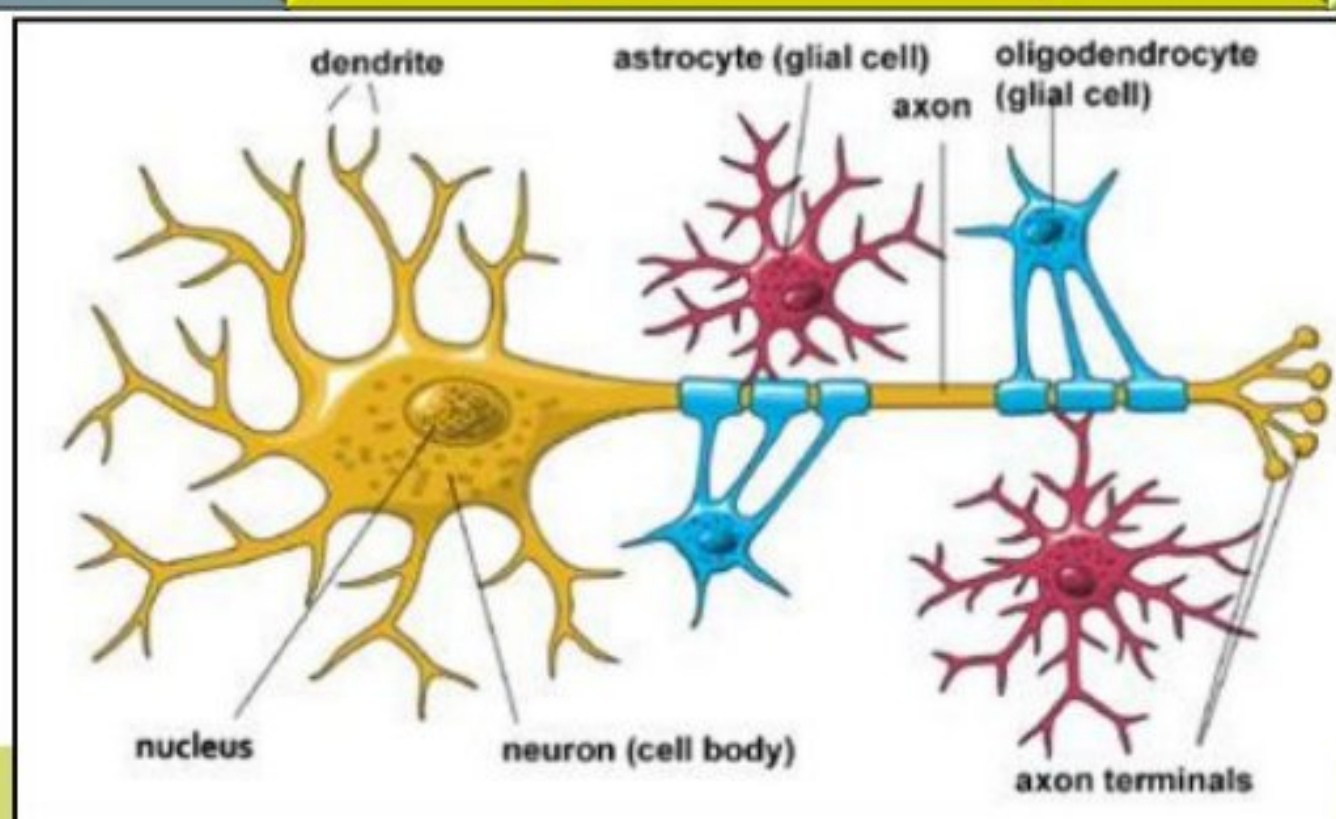
- **The main types of body tissues are:**

1. **Epithelial** tissue → ظهاري / طلائي
2. **Connective** tissue → ضام
3. **Muscular** tissue → عضلي
4. **Nervous** tissue → عصبي

Table 1: Types of tissues and their characteristics

<i>Tissue</i>	<i>Nervous</i>	<i>Epithelial</i>	<i>Muscular</i>	<i>Connective</i>
<i>Cells</i>	Have intertwining elongated processes <i>متشابك حلويات متشعبة</i>	Aggregated polyhedral cells <i>مجمعة أسطح متعددة</i>	Elongated contractile cells <i>طويلة الانقباض</i>	Several types of fixed and wandering cells <i>ثابتة طوافات متحركة</i>
<i>Amount of ECM</i>	Very small	Small	Moderate	Abundant <i>كبيرة</i>
<i>Main Function</i>	Transmission of nerve impulse	Lining, Secretion <i>تبطين الإفراز</i>	Movement <i>الحركة</i>	Support, protection <i>دعم حماية</i>

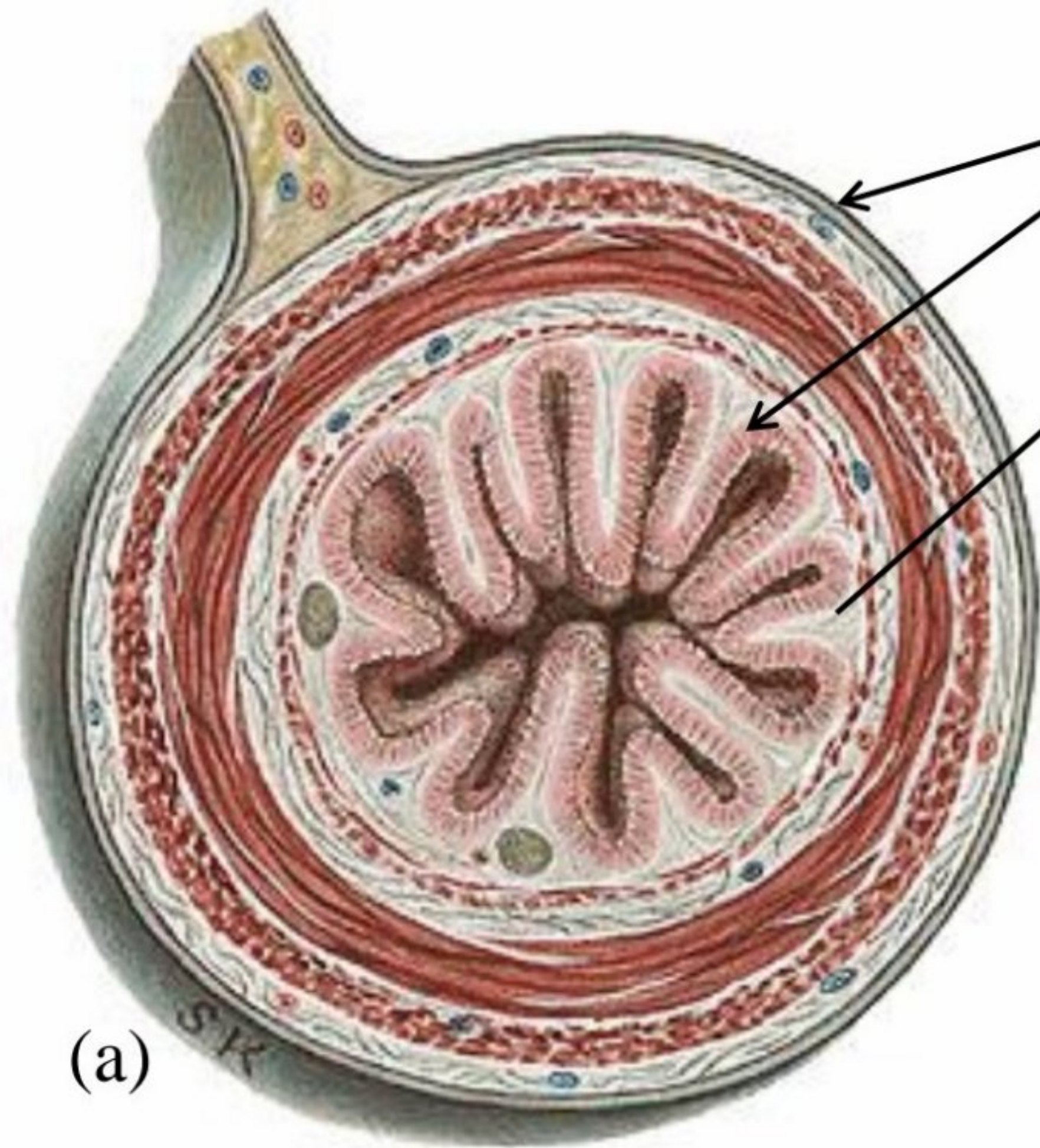
*نقل
السيال
المعبي*



Epithelial Tissue

- Epithelial tissues have the following characteristics:

- 1) Cover surfaces or line cavities. تجاويفهم
- 2) Rapid turn-over (time from the birth of a cell till its death), because it's exposed to the external environment. سريعهم تجددهم
- 3) Formed of sheets of closely packed cells. مكشوفة / معرضة لها حليقات / صفائح
- 4) The cells are polar. المقصود هنا ليس أنفا متناقضة ولكن أن كل خلية موجودة بمكان معين ولها أوضاع خاصة بها وعضو خاص
- 5) The epithelium rests upon a sheet of extracellular matrix called the *Basal Lamina*. The epithelium, also, have a connective tissue layer under it. تفتقر للأوعية الدموية
- 6) ***Epithelial tissues lack blood vessels***. They receive their nutrients from the underlying vascular connective tissue. الفذاءهم



Epithelium

Lamina propria
(connective tissue)

Fig.1: Characteristics of Epithelial tissue. (a) Cross section of small intestine. (b) Section through the skin.

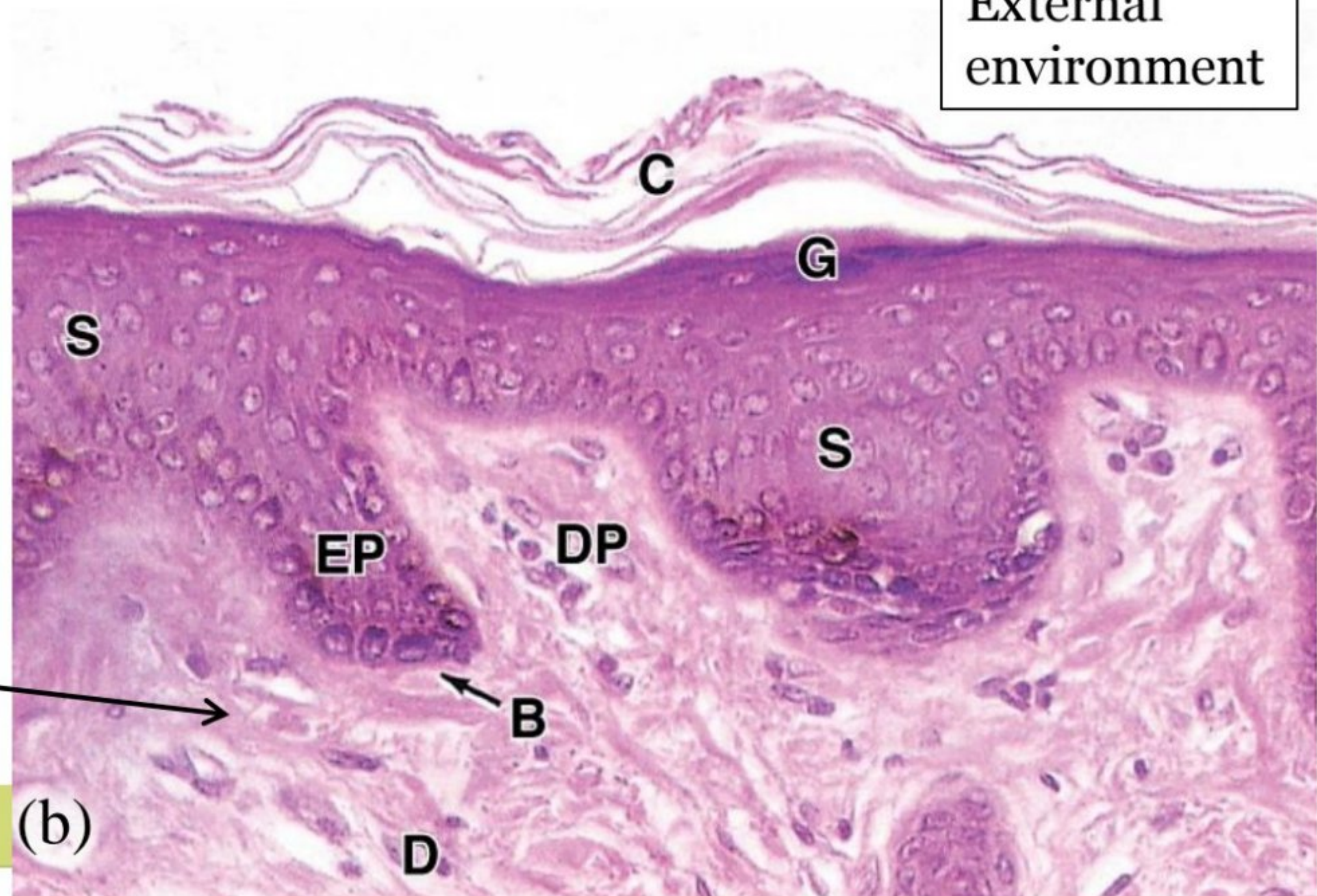
كل Epithelium يأتي تحت basement membrane
غشاء أساسي

(a)

External
environment

Epithelium = epidermis

Dermis (connective
tissue)



(b)

Basement Membrane

وظيفتها الدعم Support

- * Basement membrane is formed of the ¹basal lamina and the ²reticular lamina. The reticular lamina is the upper part of the connective tissue that's usually located under the epithelium which is rich in reticular fibers.

له ألياف

- It supports the epithelium.

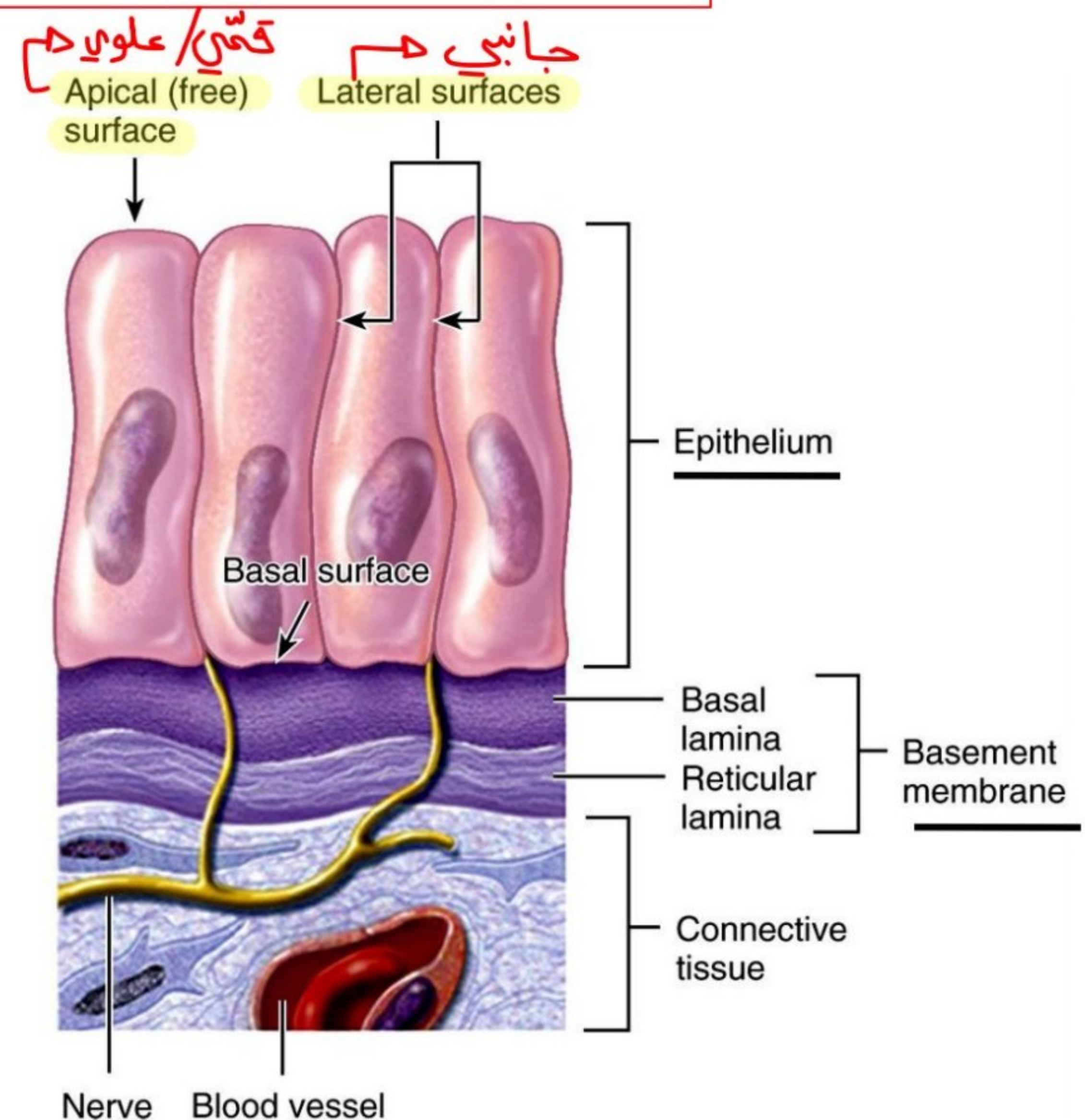


Fig.2: Difference between basal lamina and basement membrane.

Types of Epithelium

- Epithelium can be divided into two general groups:

- 1) Lining or covering epithelium
- 2) Glandular epithelium → Main function is secretion

* استثناءات لوظائف هذه المجموعات

- However, some lining epithelial cells secrete (like those in the stomach) and some glandular cells are present between lining cells (like goblet cells of small intestine)

Lining or covering epithelium

According to number of layers

Simple

(1 layer)

Stratified

(≥ 2 layers)

Pseudostratified
epithelium

طبقتين أو أكثر

فتحة

تتعدد على شكل الخلية
من فوق فقط

According to shape of cell

Squamous

المراسف

Cuboidal

مكعبة

Columnar

على شكل
عمودي

وتتكون مهدبة (ciliated)
أو بدون أهداب

According to shape of cell in upper layer

Squamous

Cuboidal

Columnar

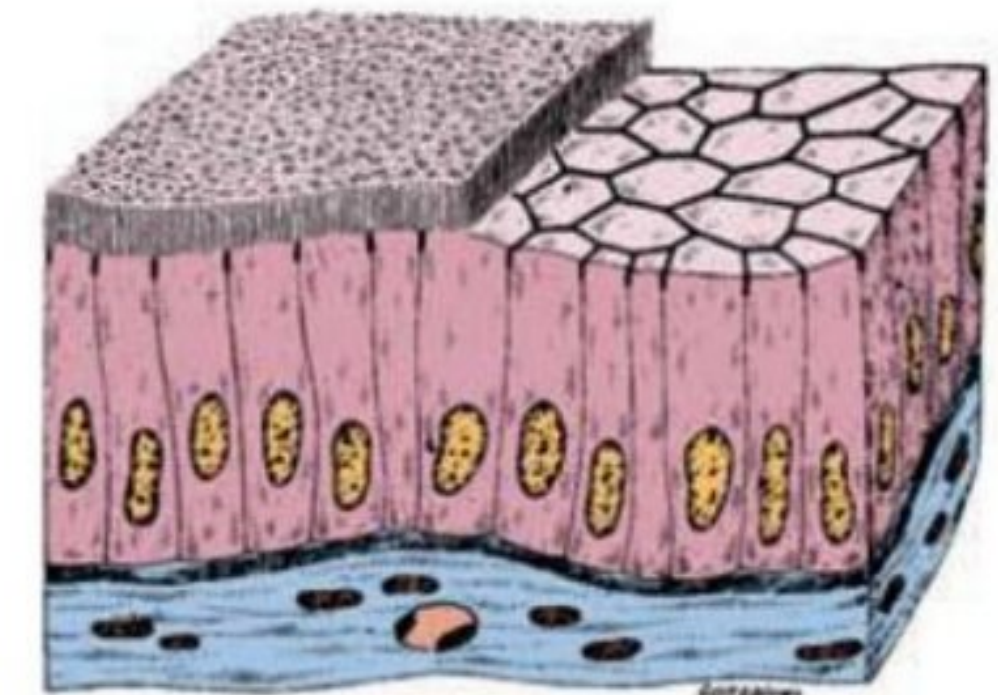
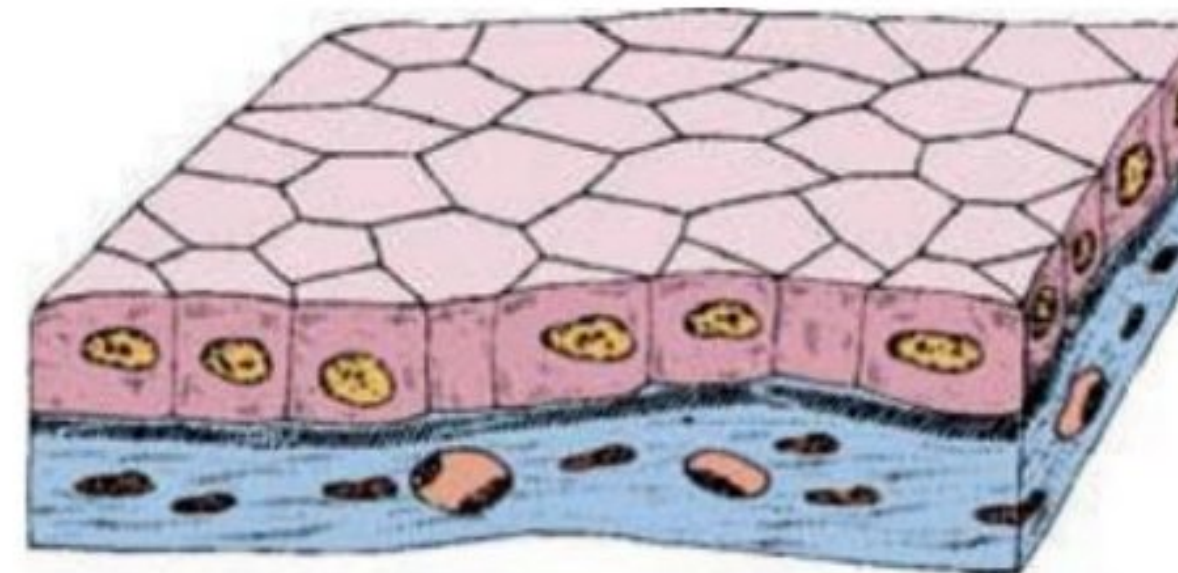
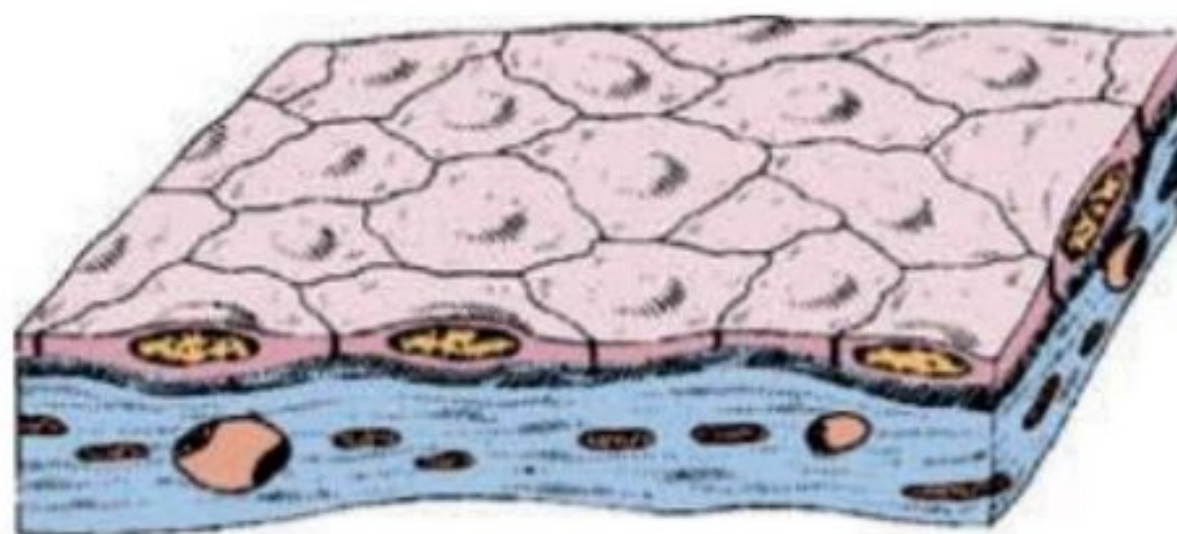
Transitional

Keratinized

Non-
keratinized

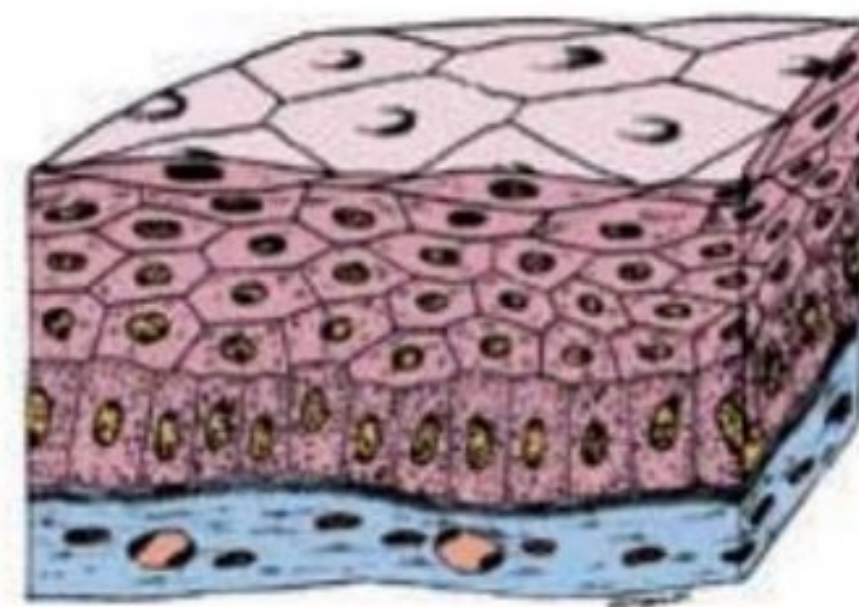
Simple Epithelium

	Simple Squamous	Simple Cuboidal	Simple Columnar
Number of Layers	<u>Single</u>	<u>Single</u>	<u>Single</u>
Cells	ممدودة Flattened squamous	<u>Cuboidal</u>	<u>Tall columnar</u>
Location	• <u>Line blood vessel</u> • <u>Line body cavities</u>	• <u>Line renal tubules</u> • <u>Cover ovaries</u>	• <u><i>Ciliated</i>: Uterine tube</u> • <u><i>Non-ciliated</i>: Stomach</u>
Function	• <u>Easy passage of substances</u> تسهل حركة المواد • <u>Secretion</u>	• <u>Active transport</u> • <u>Cover organs</u>	• <u>Secretion</u> • <u>Absorption</u> الامتصاص



Stratified Epithelium

	Stratified Squamous		Stratified Cuboidal	Stratified Columnar
	Keratinized	Non-keratinized		
Number of layers	Multiple <i>متعددة / ٨</i>	<u>Multiple</u>	<u>Multiple</u>	<u>Multiple</u>
Top-most layer	<u>Squamous cells covered by keratin layer</u>	<u>Squamous cells not covered by keratin layer</u>	<u>Cuboidal</u>	<u>Columnar</u>
Location	Skin	Esophagus <i>المريء</i>	Large ducts of salivary glands	Conjunctiva <i>الملتحمة (أحد طبقات العين)</i>
Function	<u>Protection</u> <u>Prevent water loss</u>	<u>Protection</u>	<u>Protection</u> <u>Secretion</u>	<u>Protection</u> <u>Secretion</u>



الفرد الغابي



Transitional epithelium (Urothelium):

متعلق بالجهاز البولي
(Urinary system)

❖ The topmost cells of this stratified epithelium are **dome-like** (called ***Umbrella Cells***).
على شكل قبة

❖ Location: المثانة والكلى
– Urinary **bladder** and **ureters**.
That's why it's also called ***Urothelium***.

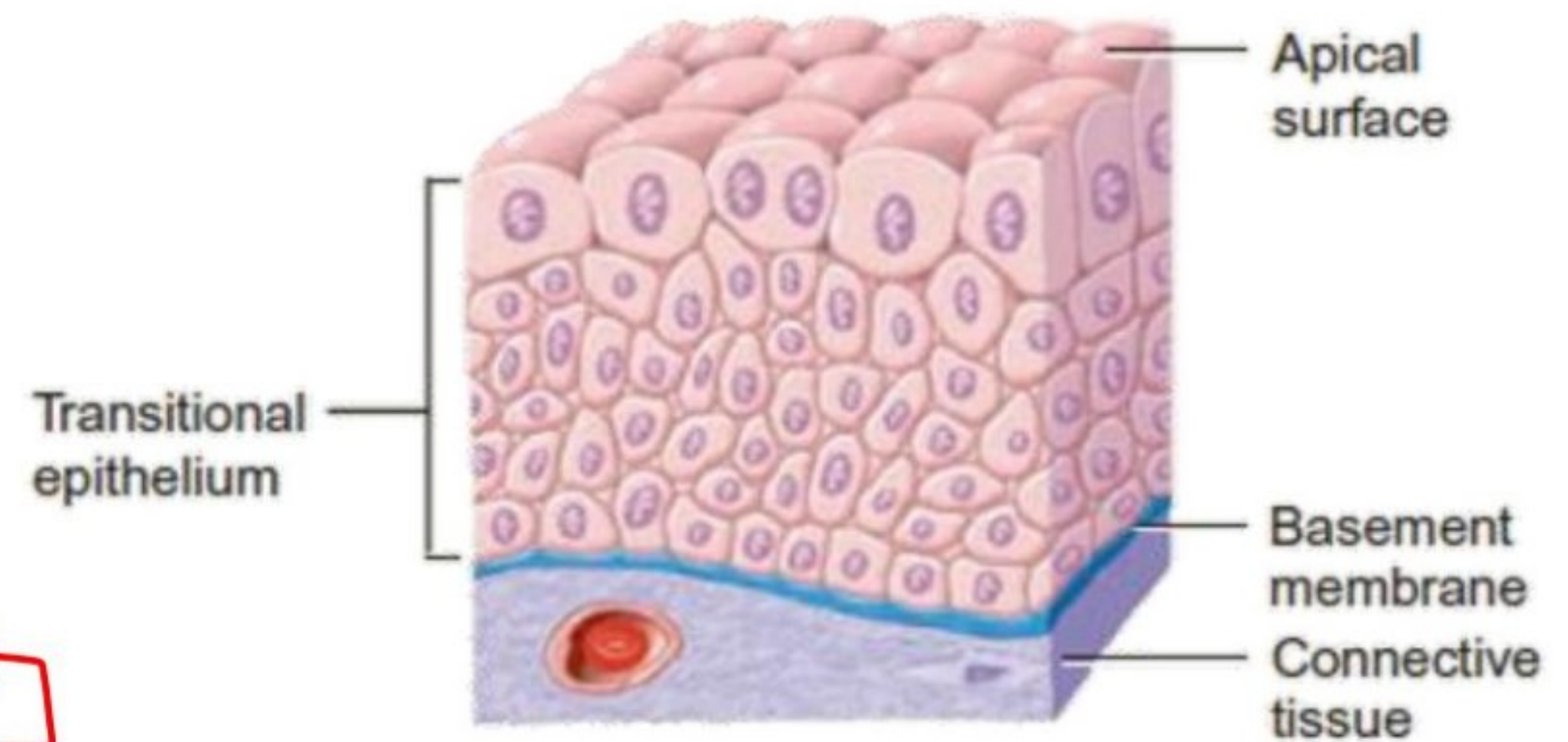


Fig.3: Relaxed transitional epithelium.

❖ The umbrella cells are dome-shaped when the bladder is **empty**. Once it's full, these cells will become flattened (hence the name transitional).
فارغة لأنها تحولت من شكل إلى آخر

❖ Functions: Protection against the **adverse** effects of **urine**.
له سلبية / ضارة
يحمي الجسم من السمية (Toxicity) الموجودة بالبول.
بول

Pseudostratified columnar ciliated epithelium:

كاذب ما

- In this epithelium, the cells have different heights. All cells rest on the same basal lamina, but not all of them reach the surface. This makes the nuclei occupy different levels giving the epithelium a false stratified appearance, but this epithelium is, actually, simple.



Fig.4: Pseudostratified columnar ciliated epithelium.

- Location: الشفبتان وتجويف الأنف (that's why it's also called Trachea, bronchi, and nasal cavity القصبية المرائية Respiratory Epithelium).
- Functions: Protection, secretion. Ciliary movement removes particles from the airway passages. حركة الأهداب تزيل الغبار الذي يدخل إلى مجرى التنفس

Glandular Epithelium

- Is an epithelium specialized for secretion.

Classification of glandular epithelium:

1) According to number of cells:

- **Unicellular** glands: formed of a single cell, like Goblet cells of digestive and respiratory tracts.
- **Multicellular** glands: formed of clusters of cells, like: salivary and sweat glands.

الغدة اللعابية

غدة العرق

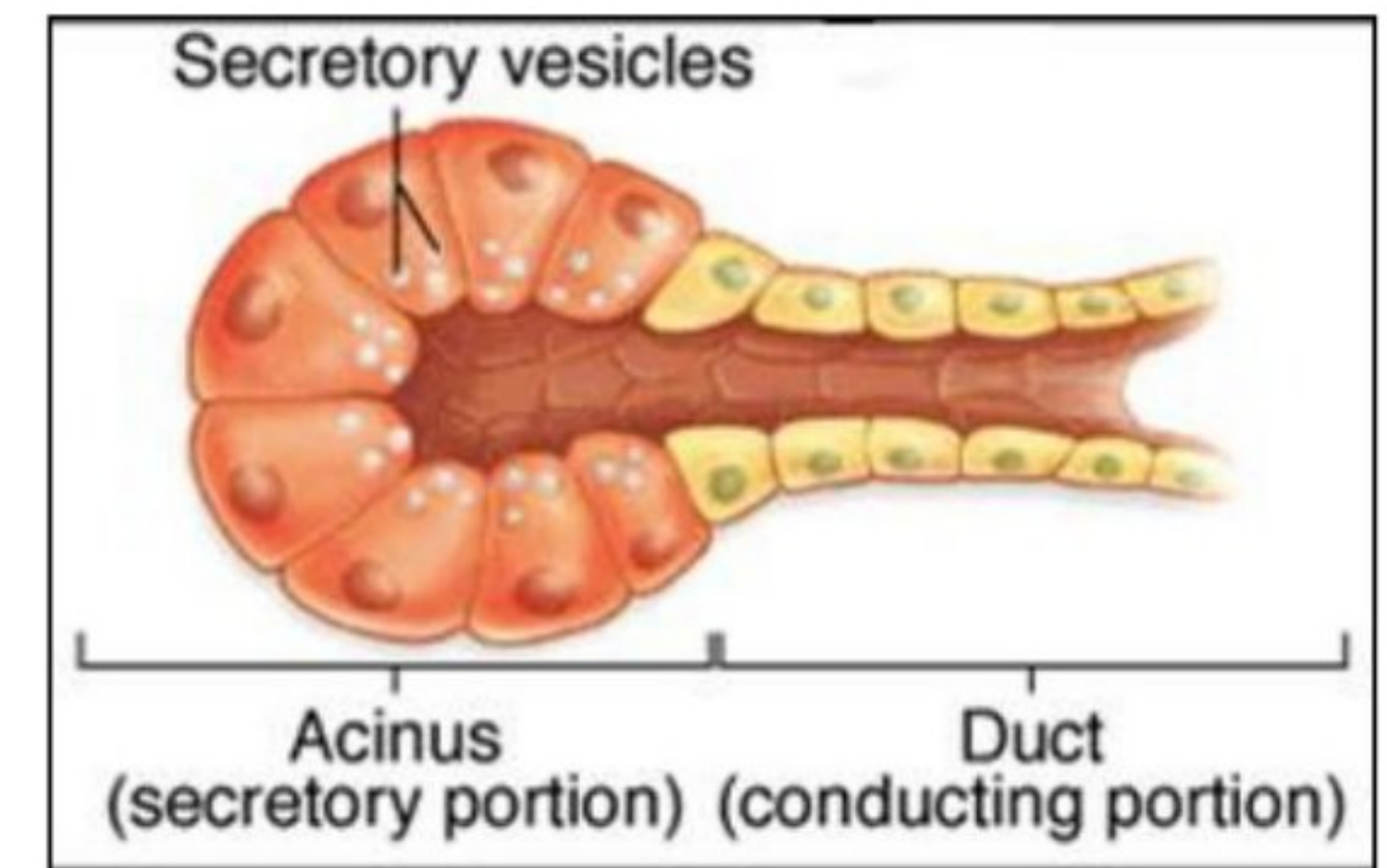
← امتلاك قنوات

2) According to presence of ducts:

- **Exocrine** glands: possess ducts that transfer the secretion to the outside of the body, like: salivary glands. إفرازها للخارج →
- **Endocrine** glands: they lack ducts. Their secretions are transferred to the target organs, usually, by blood. Example: Pancreatic Islets, Pituitary gland. إفرازها لداخل الدم →

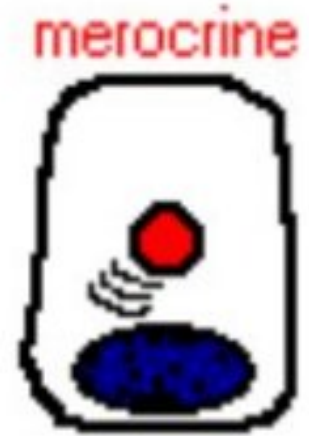
3) Exocrine glands classified according to morphology of duct and secretory portion:

- Each exocrine gland has a secretory portion that produces the secretion and a duct that carries this secretion.
- The duct and the secretory portion could be branched or unbranched.
- The secretory portion could acinar (ball-shaped), tubular, or coiled.



4) Exocrine glands classified according to method of secretion:

❑ **Merocrine:** only the product is secreted by exocytosis. As in salivary glands.



❖ Merocrine glands are either **serous** (excrete a watery solution) or **mucous** (excrete a thick solution).

مذه الفة فقط تفرز
أي أنه يخرج من فقط المادة
المفرزة.

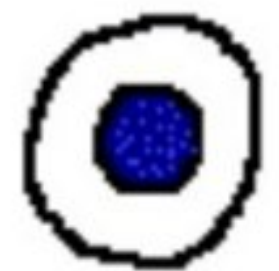
له سمين / قوامه ثقيل

❑ **Apocrine:** the product and the apical part of the cell is shed. As in mammary gland.



مثل النوع الأول لكن هنا
الجزء الأعلى من هذه الخلية سيخرج مع الإفرازات

❑ **Holocrine:** the whole cell disintegrates and is shed with the secretion. As in sebaceous glands of the skin.



كل الخلية كد إفرازاتها تخرج
يعني أن الخلية بأكملها تتفكك وتخرج مع الإفرازات.

Epithelial Cell Polarity

❖ Polarity means that various regions of a cell have specialized structural features because they perform different functions.

❖ Epithelial cells can be generally divided into 3 regions:

1. **Apical (Luminal) region:**

close to the lumen of the organ.

المنطقة العلوية

2. **Lateral regions:**

adjacent to other cells.

المنطقة الجانوية الموجودة بين كل خلية والأخرى

3. **Basal region:**

lying on the basal lamina.

الطبقة السفلية

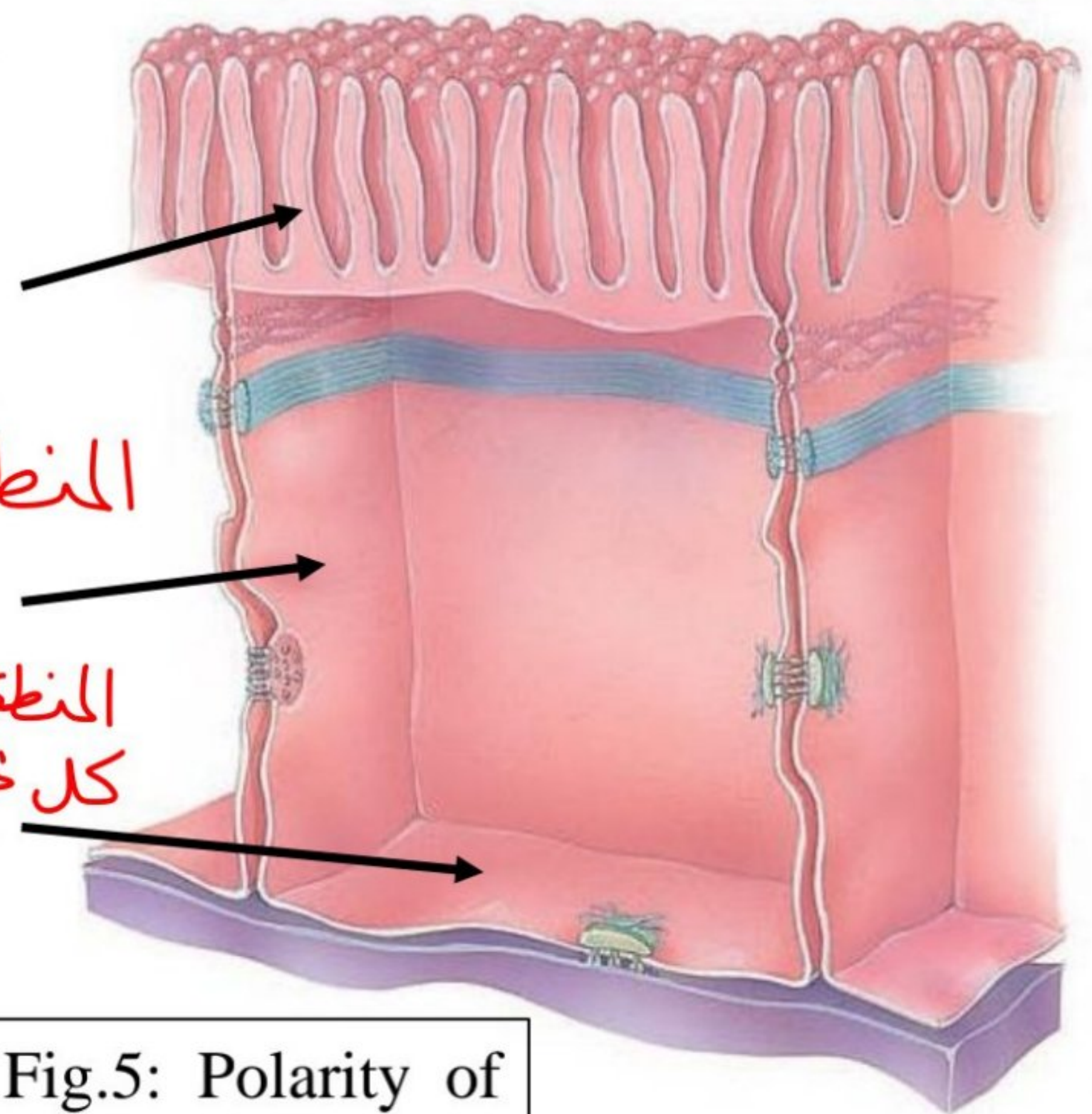


Fig.5: Polarity of epithelial cells.